In re Application of:

WEIDONG ZHU, *et al.*

Serial No.: 10/849,571

Filed: May 20, 2004

Docket No.: 266923-000007USPT

For: **SYSTEM AND METHOD FOR DETECTING STRUCTURAL DAMAGE**

Group Art Unit: 2863

Examiner: Michael P. Nghiem

Confirmation No.: 6579

Customer No.: 70001

APPEAL BRIEF UNDER 35 U.S.C. 134

MAIL STOP APPEAL BRIEF – PATENTS (VIA EFS)
COMMISSIONER FOR PATENTS
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Dear Commissioner:

In response to the Final Office Action mailed on March 8, 2011, a Notice of Appeal is being filed concurrently herewith on June 21, 2011, pursuant to 37 C.F.R. §§ 41.31, 41.20(b)(1). Appellant submits the following Appeal Brief pursuant to 35 U.S.C. § 134(a) and 37 C.F.R. §§ 41.37, 41.20(b)(2), for the above identified application.

The fees for the notice of appeal and the appeal brief were previously paid. No fees are believed due for this reinstatement of appeal, for which a notice of appeal was previously submitted on September 10, 2010 and for which an appeal brief was previously submitted on December 10, 2010, and which were deemed not acceptable, in a communication mailed on March 2, 2011, because they were not timely filed in view of a response that had been lodged but

not acted upon by the Examiner (see MPEP § 1204.01). However, to the extent necessary, authorization is hereby provided to charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Nixon Peabody, P.C. Deposit Account No. 50-4181, Order No. 266923-000007USPT.

I. REAL PARTY IN INTEREST

The real party in interest is The University of Maryland, Baltimore County, the assignee of record, a Public University that is a member of the University System of Maryland, having its administrative offices located at 1000 Hilltop Circle, Baltimore, MD 21250.

II. RELATED APPEALS AND INTERFERENCES

There are no other prior or pending appeals, interferences, or judicial proceedings known to Appellant, Appellant's legal representative, or the Assignee, which may be properly considered to be reasonably pertinent to the Board's decision in this matter.

III. STATUS OF CLAIMS

Claims 47, 49, 56-58, 60 are presently pending and stand finally rejected.

Claims 1-46, 48, 50-55 and 61 stand cancelled and take no part in the instant appeal.

Claims 59 and 62-65 stand allowed and take no part of the instant appeal.

The claims that are the subject of the instant appeal have been twice rejected, thus prompting the appeal from the decision of the primary examiner to the Board of Patent Appeals and Interferences.

IV. STATUS OF AMENDMENTS

Appeal is taken from the final rejection of claims set forth in the Final Office Action dated March 8, 2011 (hereinafter "the Office Action")(**Exhibit 1**).

Amendments were introduced in the Amendment filed September 9, 2010, in which 56 was amended to address and overcome a claim objection, claim 59 was amended in independent form to place claim 59 in condition for allowance, and claims 62-65 were added. Claims 15-16, 48, 50-54 and 61 were further cancelled therein without prejudice or disclaimer to expedite prosecution.

A listing of the claims that are on appeal is provided in the attached Appendices. *See*, *infra* § IX, Claims on Appeal.

V. SUMMARY OF CLAIMED SUBJECT MATTER

All paragraphs and line numbers indicated below are designated with respect to the subject specification as published in U.S. Patent Application Publ. No. 2005/0072234 A1 (attached hereto as **Exhibit 2**). To that extent, much of the description set forth hereinbelow is made with respect to the various representative embodiments depicted and described in the subject specification and accompanying drawings. These descriptive comparisons and exemplifications are made for explanatory purposes to comply with 37 C.F.R. § 41.37(c)(1)(v), and are therefore not intended to be limiting and should not be construed as limiting. A copy of the replacement drawings submitted in this application are attached hereto as **Exhibit 9**.

A. INDEPENDENT CLAIM 47

Claim 47 recites a system (100; *see e.g.*, FIG. 1A; ¶¶ [0062]-[0064]) for determining stiffness parameters of a structure, comprising a sensor (110; FIG. 1A) arranged to measure vibrations of said structure and output vibration information (*e.g.*, via sensor coupler 113; *see*

e.g., FIG. 1A; ¶ [0064]). The system (100; *see e.g.*, FIG. 1A; ¶¶ [0062]-[0064]) further comprises a stiffness parameter unit (103; *see e.g.*, FIG. 1A; ¶¶ [0064]-[0067]) for receiving said vibration information (*e.g.*, via input 114; FIG. 1A), determining natural frequency data of said structure (*see e.g.*, ¶¶ [0062]-[0065]), and determining the stiffness parameters of said structure using said natural frequency data (*see e.g.*, ¶¶ [0064]-[0067]; see also methodology set forth in ¶¶ [0068]-[0155] and subsequent examples in ¶¶ [0156]-[0180], with subsequent simulation and experimental validation shown in ¶¶ [0181]-[0218]). The stiffness parameter unit (103; *see e.g.*, FIG. 1A; ¶¶ [0064]-[0067]) comprises an iterative processing unit (*e.g.*, 115, 117, 119; *see e.g.*, FIG. 1A; ¶¶ [0065]-[0066]) that determines said stiffness parameters using a first order eigenvalue sensitivity analysis and one of the generalized inverse method (*see, e.g.*, FIGS. 1A-1B; ¶¶ [0065]-[0066], ¶¶ [0137], [0160], [0163], [0178], [0210]), gradient method (*see, e.g.*, ¶¶ [0137]-[0144]), or quasi-Newton method (*see, e.g.*, ¶¶ [0145]-[0149]), and wherein a number of said stiffness parameters is larger than a number of system equations such that the system equations are severely underdetermined (*see, e.g.*, ¶¶ [0179]-[0182], ¶ [0188]; FIG. 12).

B. INDEPENDENT CLAIM 49

Claim 49 recites a system (100; *see e.g.*, FIG. 1A; ¶¶ [0062]-[0064]) for determining stiffness parameters of a structure, comprising a sensor (110; FIG. 1A) arranged to measure vibrations of said structure and output vibration information (*e.g.*, via sensor coupler 113; *see e.g.*, FIG. 1A; ¶ [0064]). The system (100; *see e.g.*, FIG. 1A; ¶¶ [0062]-[0064]) also includes a stiffness parameter unit (103; *see e.g.*, FIG. 1A; ¶¶ [0064]-[0067]) for receiving said vibration information (*e.g.*, via input 114; FIG. 1A) and determining said stiffness parameters with an iterative processing unit (*e.g.*, 115, 117, 119; *see e.g.*, FIG. 1A; ¶¶ [0065]-[0066]). The stiffness parameter unit (103; *see e.g.*, FIG. 1A; ¶¶ [0064]-[0067]) comprises an iterative processing unit (*e.g.*, 115, 117, 119; *see e.g.*, FIG. 1A; ¶¶ [0065]-[0066]) that determines said stiffness

parameters using a first order eigenvalue sensitivity analysis (*see, e.g.*, FIGS. 1A-1B; ¶¶ [0065]-[0066], ¶¶ [0137]-[0149], [0160], [0163], [0178], [0210]), wherein a number of said stiffness parameters is larger than a number of system equations such that the system equations are severely underdetermined (*see, e.g.*, ¶¶ [0179]-[0182], ¶ [0188]; FIG. 12).

C. INDEPENDENT CLAIM 56

Claim 56 recites a system (100; *see e.g.*, FIG. 1A; ¶¶ [0062]-[0064]), comprising a structure (*e.g.*, 1600; FIG. 31) and a random impact device (*e.g.*, 1570, 1580; FIG. 31; *see, e.g.*, ¶¶ [0227]-[0232]) for introducing vibrations in said structure (*e.g.*, 1600; FIG. 31). The random impact device (*e.g.*, 1570, 1580; FIG. 31; *see, e.g.*, ¶¶ [0227]-[0232]) comprises a random signal generating unit (*e.g.*, 1560; FIG. 31; *see, e.g.*, ¶¶ [0227]-[0232]) for generating first outputs (*e.g.*, 1590; FIG. 31; ¶¶ [0228]-[0229]) and second outputs (*e.g.*, 1591; FIG. 31; ¶¶ [0228]-[0229]). The random impact device (*e.g.*, 1570, 1580; FIG. 31; *see, e.g.*, ¶¶ [0227]-[0232]) comprises a random impact actuator (*e.g.*, 1570; FIG. 31; *see, e.g.*, ¶¶ [0227]-[0232]) receives the first and second outputs (*e.g.*, 1590, 1591; FIG. 31; ¶¶ [0228]-[0229]). The random impact device (*e.g.*, 1570, 1580; FIG. 31; *see, e.g.*, ¶¶ [0227]-[0232]) comprises an impact applicator (*e.g.*, 1580; FIG. 31; *see, e.g.*, ¶¶ [0227]-[0232]) coupled to the random impact actuator (*e.g.*, 1570; FIG. 31; *see, e.g.*, ¶¶ [0227]-[0232]). The random impact actuator (*e.g.*, 1570; FIG. 31; *see, e.g.*, ¶¶ [0227]-[0232]) drives the impact applicator (*e.g.*, 1580; FIG. 31; *see, e.g.*, ¶¶ [0227]-[0232]) such that force and arrival times of the impact applicator at said structure (*e.g.*, 1600; FIG. 31) are random (*see, e.g.*, ¶ [0231]). A sensor (*e.g.*, 110; FIG. 31; *see, e.g.*, ¶¶ [0227]-[0232]) is arranged to measure vibrations of the structure and output vibration information (*e.g.*, via sensor coupler 113; *see e.g.*, FIG. 31; ¶ [0232]) and a stiffness parameter unit (103; *see e.g.*, FIG. 31; ¶ [0228], ¶ [0232]) is provided to receive the vibration information output by the sensor (*e.g.*, 110), determine natural frequency data of the structure (*e.g.*, 1600; FIG. 31; ¶ [0232]), and

determine the stiffness parameters (*see, e.g.*, ¶ [0232]) of the structure using the natural frequency data.

D. INDEPENDENT CLAIM 60

Claim 60 recites a system (100; *see e.g.*, FIG. 1A; ¶¶ [0062]-[0064]) for determining stiffness parameters of a structure, comprising a sensor (110; FIG. 1A) arranged to measure vibrations of said structure and output vibration information (*e.g.*, via sensor coupler 113; *see e.g.*, FIG. 1A; ¶ [0064]) and a stiffness parameter unit (103; *see e.g.*, FIG. 1A; ¶¶ [0064]-[0067]) for receiving said vibration information (*e.g.*, via input 114; FIG. 1A), determining mode shape information (*e.g.*, 115, 117, 119; *see e.g.*, FIG. 1A; ¶¶ [0064]-[0065]; [0195], [205], [0210]-[0211], [0216], [0220]-[0232]), and determining the stiffness parameters of said structure using said mode shape information (*see, e.g.*, FIGS. 1A-1B; ¶¶ [0064]-[0065], ¶¶ [0064]-[0065]; [0195], [205], [0210]-[0211], [0216], [0220]-[0232]). The stiffness parameter unit (103; *see e.g.*, FIG. 1A; ¶¶ [0064]-[0067]) comprises an iterative processing unit (*e.g.*, 115, 117, 119; *see e.g.*, FIG. 1A; ¶¶ [0065]-[0066]) that determines said stiffness parameters using a first order eigenvector sensitivity analysis (*see, e.g.*, FIGS. 1A-1B; ¶¶ [0065]-[0066], ¶¶ [0137]-[0149], [0160], [0163], [0178], [0210]), wherein a number of said stiffness parameters is larger than a number of system equations such that the system equations are severely underdetermined (*see, e.g.*, ¶¶ [0179]-[0182], ¶ [0188]; FIG. 12).

VI. <u>GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL</u>

1. Whether claims 47, 49, and 60 have been shown by the Examiner to be indefinite under 35 U.S.C. § 112, second paragraph.

2. Whether claims 47, 49, and 60 have been shown by the Examiner to fail to comply with the written description requirement under 35 U.S.C. 112, first paragraph.

3. Whether claims 56-58 have been shown by the Examiner to be unpatentable under

35 U.S.C. 103(a) over Stubbs (US 5,327,358).

VII. ARGUMENTS

1. 35 USC § 112, 2ND PARAGRAPH REJECTION

Claims 47, 49, and 60 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. The Examiner supported this rejection by presenting a query, stating "why is that when the 'number of the stiffness parameters being larger than a number of system equations', 'the system equations are severely underdetermined'?" The Examiner stated that "[t]he system equations being severely underdetermined is not understood."

In the Examiner's Response to Arguments section of the Final Office Action, the Examiner states that

> Examiner's position is that the claims do not recite the number of unknowns are more than the number of equations. Instead, the claims recite "the number of stiffness parameters being larger than a number of system equations" (see claim 47, lines 11- 12). The stiffness parameters have been determined by the iterative processing unit (see claim 47, lines 8-10). Thus, the stiffness parameters are known. Thus, it is unclear why the systems equations are severely underdetermined when a number of known/determined parameters is larger than a number of system equations.

(Page 8 of Final Office Action)(emphasis in original).

Appellants traverse this rejection and respectfully submit that claims 47, 49, and 60 particularly point out and distinctly claim the subject matter which the Appellants regard as the invention, as disclosed in Appellant's disclosure. Definiteness of claim language must be analyzed in light of (1) the content of the application disclosure, (2) the teachings of the prior art, and (3) the claim interpretation that would be given by one of ordinary skill in the art at the time the invention was made. *See, e.g., In re Moore*, 439 F.2d 1232, 1235; 169 USPQ 236, 238 (CCPA 1971). The essential inquiry is whether the claims set out and circumscribe a particular

subject matter with a *reasonable* degree of clarity. A claim term that is not used or defined in the specification is not indefinite if the meaning of the claim term is discernible to one skilled in the art. *Bancorp Services, L.L.C. v. Hartford Life Ins. Co.*, 359 F.3d 1367, 1372, 69 USPQ2d 1996, 1999-2000 (Fed. Cir. 2004). Further, breadth of a claim is not to be equated with indefiniteness. *In re Miller*, 441 F.2d 689, 169 USPQ 597 (CCPA 1971).

Moreover, the requirements for clarity and precision "must be balanced with the limitations of the language and the science" and "[i]f the claims, read in light of the specification, reasonably apprise those skilled in the art both of the utilization and scope of the invention, and if the language is as precise as the subject matter permits, the statute (35 U.S.C. 112, second paragraph) demands no more." *Shatterproof Glass Corp. v. Libbey Owens Ford Co.*, 758 F.2d 613, 225 USPQ 634 (Fed. Cir. 1985); *see also, e.g., Hybritech, Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 231 USPQ 81 (Fed. Cir. 1986). In this regard, as stated in MPEP § 2173.05(a).II, "[i]f the proposed language is not considered as precise as the subject matter permits, the examiner should provide reasons to support the conclusion of indefiniteness and is encouraged to suggest alternatives that are free from objection."

As an initial matter, the Examiner has set forth **<u>no</u>** factual findings or evidence setting forth the level of ordinary skill. The skill-level determination is an important guarantee of objectivity in an obviousness analysis. *Al-Site Corp. v. VSI Intl Inc.*, 174 F.3d 1308, 1324, 50 USPQ2d 1161, 1171 (Fed. Cir. 1999). The inquiry into how a person of ordinary skill in the art understands a claim term provides an objective baseline from which to begin claim interpretation. *Innova/Pure Water, Inc. v. Safari Water Filtration Systems, Inc.*, 381 F.3d 1111 (Fed. Cir. 2004). As noted by this Honorable Board in *Ex Parte Jud* (Appeal No. 2006-1061, Application No. 09/505,713; Decided: 30 January 2007), "[t]he applicant's disclosure provides a

starting point for determining the level of skill in the art, followed by references and additional testimony, if any." (see page 4, subpart B). Continuing on, *Ex Parte Jud* states that "an enabling disclosure implies a minimum base of technical knowledge and ability for 'any person' skilled in the pertinent art at the time of filing. *E.g., Koito Mfg. Co. v. Turn-Key-Tech, LLC*, 381 F.3d 1142, 1156, 72 USPQ2d 1190, 1200 (Fed. Cir. 2004) ('[A] patent applicant does not need to include in the specification that which is already known to and available to one of ordinary skill in the art.')." (see page 4, subpart B.1). *Ex Parte Jud* further states that "[t]he disclosure sets a floor rather than a ceiling on the level of skill." *Id.* The Examiner's assertion of a **single** piece of inapplicable prior art (Stubbs) is submitted to be both factually and legally **insufficient** to establish, directly or indirectly, evidence of the level of skill in the art, a key to analysis of patentability. Of course, the skill level of the examiner itself introduces an inherent limitation on the inquiry as an examiner cannot properly interpret an application or claims that is beyond his ken. By the same token, if an examiner cites one or more inapposite references, why would that be deemed sufficient by any tribunal to establish a level of ordinary skill in the art? References are generally entitled to great weight because they are almost always prepared without regard to their use as evidence in the particular examination in which they are used. *See, e.g., Velander v. Garner*, 348 F.3d 1359, 1371, 68 USPQ2d 1769, 1778 (Fed. Cir. 2003)(contrasting preexisting references and litigation-inspired testimony from the authors of the references). However, the examiner's ***selection*** of references reflects an examiner's understanding of a matter and reflects the examiner's level of knowledge and potential biases – if the examiner does not fully understand an application, is the examiner can then able to select and cite references that are a true reflection of the level of ordinary skill in the art? Thus, while references themselves are an unbiased testament to a level of skill in the field to which that reference is applicable, it is not

necessarily reflective of an ordinary level of skill of an application in question. In the present case, what would happen if the examiner were to have withdrawn the Stubbs reference and cited another reference? Would the level of ordinary skill in the art then change to reflect such a newly cited reference? Is the "level of ordinary skill in the art" really so malleable and subjective?

Appellant respectfully submits that the level of ordinary skill in the art is properly reflected in Appellant's specification. *See Ex Parte Jud*, Appeal No. 2006-1061, Application No. 09/505,713; page 4, subpart B; Decided: 30 January 2007)(*stating* "[t]he applicant's disclosure provides a starting point for determining the level of skill in the art, followed by references and additional testimony, if any."). From the disclosure therein, it is submitted that one of ordinary skill in the art would be sufficiently apprised as to the subject matter set out and circumscribed in the claims.

Moreover, to the degree that any references of record are to be utilized by this Honorable Board in ascertaining the "level of ordinary skill in the art" it is noted that, of the eight references cited by the examiner during the lengthy prosecution of this application (excluding the citation to Webster's dictionary), three of the eight references were publications by the first named inventor of the present application. "While it is always preferable for the factfinder below to specify the level of skill it has found to apply to the invention at issue, the absence of specific findings on the level of skill in the art does not give rise to reversible error 'where the prior art itself reflects an appropriate level and a need for testimony is not shown.' *Litton Indus. Prods., Inc. v. Solid State Sys. Corp.*, 755 F.2d 158, 163, 225 USPQ 34, 38 (Fed. Cir. 1985); *Okajima v. Bourdeau*, 261 F.3d 1350, 1355, 59 USPQ2d 1795, 1797 (Fed. Cir. 2001) (affirming decision in interference). However, this inquiry must ascertain the level of ordinary skill in the art at the

time the invention was made, and ***not*** the level of skill in the art of the inventor himself or herself, the level of skill in the art of those skilled in remote arts, or to geniuses in the art at hand. *Environmental Designs, Ltd. v. Union Oil Co.*, 713 F.2d 693, 218 USPQ 865 (Fed. Cir. 1983), cert. denied, 464 U.S. 1043 (1984).

Given this precedent, the center of mass, as it were, of the cited references would seem to reflect a level of ordinary skill level that is that of the first named inventor, Dr. Weidong Zhu. From this vantage, the Examiner would seem to be asserting that someone having a Ph.D. in Mechanical Engineering from the University of California at Berkeley that is a Professor of Mechanical Engineering would not find that the claims set out and circumscribe a particular subject matter with a reasonable degree of clarity (to such person of ordinary skill in the art) and, further, would seem to be simultaneously discounting entirely such skilled person's (i.e., Dr. Zhu's) statements and arguments of the claim interpretation that *would* have been given by one of ordinary skill in the art at the time the invention was made. *See, e.g., In re Moore*, 439 F.2d 1232, 1235; 169 USPQ 236, 238 (CCPA 1971). The internal conflict in the Examiner's treatment of the level of ordinary skill in the art is manifest. Moreover, to the extent that the level of ordinary skill in the art were to be asserted to be that of a someone having a Ph.D. in mechanical engineering, and further having almost 20 years of experience in vibration and stability of distributed structural systems and finite element modeling, modal testing, model updating, and structural damage detection, then does the Examiner himself possess such credentials? Is an Examiner having a lower level of skill, such as a Bachelor's degree or a Master's degree, able to sufficiently understand an invention requiring a ***higher*** level of skill (e.g., a Ph.D.) to then credibly assert that such person of ordinary skill in the art would ***not*** understand the subject matter set out and circumscribed in the claims "with a reasonable degree

of clarity" in view of the specification and in view of the knowledge available to such person of ordinary skill in the art?

Further, to what degree are references of record submitted by Appellants in the Appellant's information disclosure statements during prosecution to be utilized by the Examiner and this Honorable Board in ascertaining the "level of ordinary skill in the art," as these are the references which commended themselves to Appellant's attention?

The Examiner in the instant case has not provided articulated **reasons** to support the conclusion of indefiniteness, but has instead merely set forth a question coupled with an admission of a lack of understanding. A statement of rejection under any ground requires a *prima facie* showing and a rejection under 35 U.S.C. § 112, second paragraph should "provide ***an analysis*** as to ***why*** the phrase(s) used in the claim is 'vague and indefinite'" (*see, e.g.*, MPEP § 2173.02)(emphasis added). There has been no showing of what the Examiner regards as the level of ordinary skill in the art or why, in view of such level of ordinary skill and the disclosure and evidence of record, why such hypothetical person would not find the claims to set out and circumscribe the recited subject matter with a *reasonable* degree of clarity.

In an attempt to supplement this evidentiary deficiency, the Examiner takes the position is that the claims "do not recite the number of unknowns are more than the number of equations" and that instead claims recite "the number of stiffness parameters being larger than a number of system equations" (page 8 of Final Office Action)(emphasis in original). The Examiner then takes an inappropriate position that the "stiffness parameters have been determined by the iterative processing unit (see claim 47, lines 8-10)" and that, therefore, "the stiffness parameters are known". This confused reading of the claims is then presented a query by the Examiner, stating that it is "unclear why the systems equations are severely

underdetermined when a number of known/determined parameters is larger than a number of system equations." (page 8 of Final Office Action)(emphasis in original).

The specification and the claims properly presume a minimum level of understanding by those of ordinary skill in the art. A patent need not teach, and preferably omits, what is well known in the art. *See, e.g.*, *Phillips v. AWH Corp.*, 415 F.3d 1303, 75 USPQ2d 1321 (Fed. Cir. 2005); *In re Buchner*, 929 F.2d 660, 661, 18 USPQ2d 1331, 1332 (Fed. Cir. 1991); *Hybritech, Inc. v. Monoclonal Antibodies, Inc.*,802 F.2d 1367, 1384, 231 USPQ 81, 94 (Fed. Cir. 1986), *cert denied*, 480 U.S. 947 (1987); *Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick Co.*, 730 F.2d 1452, 1463, 221 USPQ 481, 489 Fed. Cir. 1984); *Phillips v. AWH Corp.*, for example, stated that "[i]mportantly, the person of ordinary skill in the art is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification." 415 F.3d at 1313; *see also Multiform Desiccants, Inc. v. Medzam, Ltd.*, 133 F.3d 1473, 1477 (Fed. Cir. 1998); *Medrad, Inc. v. MRI Devices Corp.*, 401 F.3d 1313, 1319 (Fed. Cir. 2005) ("We cannot look at the ordinary meaning of the term . . . in a vacuum. Rather, we must look at the ordinary meaning in the context of the written description and the prosecution history.").

The Examiner's claim construction is devoid of any utilization of the Applicant's specification aside from the mere repeating of selected Appellant's remarks. It is well-settled law that the claims do not stand alone. Rather, they are part of "a fully integrated written instrument" and that claims "must be read in view of the specification, of which they are a part." *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 978-79 (Fed. Cir. 1995) (*en banc*), *aff'd*, 517 U.S. 370, 134 L. Ed. 2d 577, 116 S. Ct. 1384 (1996). "The specification is, thus, the primary basis for construing the claims." *Standard Oil Co. v. Am. Cyanamid Co.*, 774 F.2d 448, 452 (Fed.

Cir. 1985). Despite this well-settled law, the Examiner shuns the interpretive guidance afforded by the specification and "construes" the claim language, in isolation, in a legally erroneous and factually improper manner. Moreover, the Examiner, ***having ignored the specification in interpreting the claims***, then turns around and rejects claims 47, 49 and 60 as "being indefinite" and as "failing to comply with the written description requirement". Appellant's submit that the Examiner's circular and self-fulfilling logic is entirely inappropriate and entirely at odds with the requirement to read the claim as would one of ordinary skill in the art (itself not ascertained by the Examiner) "not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification."

As one example of the Examiner's error, the stiffness parameters are not "known," they are determined (see, e.g., ¶¶ [0068]-[0069] of Appellant's specification, stating a methodology in accord with the disclosed concepts wherein "[t]his method presented below can simultaneously identify *all the unknown stiffness parameters* and is formulated as a damage detection problem.")(emphasis added). This determination of the stiffness parameters is performed, according to claim 47 (for example), using "natural frequency data" determined for the structure of interest. Claim 47 further recites that, in the claimed system, "a number of said stiffness parameters is larger than a number of system equations such that the system equations are severely underdetermined." The claim itself sets forth the relationship between the parameters and the conditions of the claimed system for determining stiffness parameters of a structure. To this, the Examiner expresses confusion and asserts that the Appellant's specification and/or claims are deficient.

It is Appellant's position that one of ordinary skill in the art would *readily* understand both the specification and the claim language. Regarding the claim language "a number of said

stiffness parameters is larger than a number of system equations such that the system equations are severely underdetermined," one of ordinary skill would refer, by way of example, to the "system equations" (5) and (6), which are referred to in numerous contexts throughout Appellant's specification (see, e.g., ¶¶ [0130], [0160], [0163], [0173], [0174], [0182], [0188], [0208], [0211], [0215], [0216], and [0220]). Of course, just as the claims are not set forth in a vacuum, the system equations are not disclosed in a vacuum and are amply, if not exhaustively, described in Appellant's specification. The system equations and corresponding development, analysis, and proofs are set forth in Appellant's specification showing the relationship between the system equations, the stiffness parameters, and changes in the stiffness parameters, such as would be attributable to damage to the structure (see, e.g., ¶¶ [0069]-[0133]). For example, as set forth in Appellant's specification, ¶ [0130], "[w]ith reduced measurements the unmeasured degrees of freedom of $\Phi_d{}^k$ is estimated first using a modified eigenvector expansion method (see the beam and frame examples below) and $\Phi_d{}^k$ is mass-normalized subsequently" and that "[o]nly the component equations corresponding to the measured degrees of freedom of $\Phi_d{}^k$ are used in (6)." Continuing, ¶ [0130] states that "[t]he system equations in Eqs. (5) and (6) involves $n_\lambda + n_\varphi N_m$ scalar equations with m unknowns, which are in general determinate if $n_\lambda + n_\varphi N_m = m$, under-determined if $n_\lambda + n_\varphi N_m < m$, and over-determined if $n_\lambda + n_\varphi N_m > m$" and that "[i]n the first iteration, λ^k and Φ^k in (5) and (6) correspond to the eigenparameters of the structure with the initial stiffness parameters $Gi^{(0)}$.

As to the Examiner's avowed confusion regarding the system equations being "underdetermined" or "severely underdetermined," the analysis of definiteness of the claim language must be performed in light of the content of the application disclosure, the teachings of the prior art, and the claim interpretation that would be given by one of ordinary skill in the art at

the time the invention was made. It is initially noted that, as is common knowledge, if there are fewer measurements available then there are unknown parameters for a system to be modeled, then the parameter estimation problem is said to be "underdetermined." Stated differently, for a linear system having m equations and n unknowns, the system is "underdetermined" if $n > m$ (and is "overdetermined" if $m > n$). Severely underdetermined system of linear equations include systems wherein $n >> m$ (i.e., far more unknowns than equations, where n represents unknowns and m represents equations).

Information which is well known in the art need not be described in detail in the specification. *See, e.g., Hybritech, Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1379-80, 231 USPQ 81, 90 (Fed. Cir. 1986). Turning to the "teachings of the prior art," it is noted that printed patents and patent application publications utilizing the terminology "severely underdetermined" do not themselves explicitly define "severely underdetermined" and, instead, utilize such terminology with the understanding that such terminology is understood by those of ordinary skill in the art, much as treatment of other mathematical concepts are not belabored (*see, e.g.*, **Exhibit 3**, U.S. Pat. No. 6,526,354, *stating* in col. 11, lines 50-53 that "more complex models require extremely complicated inversions, or may be *severely underdetermined* by the available data")(emphasis added); **Exhibit 4**, U.S. Pat. No. 5,654,820, *stating* in col. 33, lines 54-55 that "[i]n this simulation, the system is *severely underdetermined*.")(emphasis added); **Exhibit 5,** "TVAR Modeling of Event Related Synchronization Changes. The Optimal Basis Approach" by J.P. Kaipioy and P.A. Karjalainenz, University of Kuopio Department of Applied Physics Report Series ISSN 0788-4672 (March 1995), page 1, (stating "we cannot assume that the parameters are arbitrarily time-varying since the parameter estimation problem would be *severely underdetermined* with an infinity of parameter evolutions that yield vanishing prediction

errors.")(emphasis added); **Exhibit 6**, "Solving or Resolving Inadequate and Noisy Tomographic Systems" by Guust Nolet, Journal of Computational Physics 61, 463-482 (1985)(stating in abstract on page 1 that "[t]o avoid unwarranted conclusions when the problem is *severely underdetermined* or undermined with large data errors, resolution analysis must be applied to the data set." (emphasis added). Similarly, other publications utilize the terminology "highly underdetermined" or "significantly underdetermined". *See, e.g.,* **Exhibit 7** (see page 18 of reference D142 in modified Form PTO-1449 submitted with IDS that was considered by Examiner on August 20, 2008, entitled "Damage Identification and Health Monitoring of Structural and Mechanical Systems from Changes in Their Vibration Characteristics: A Literature Review" by Doebling, Scott W., et. al., Los Alamos National Laboratory, May 1996)(*stating* "[t]his difficulty occurs because the system is *significantly underdetermined*, so there is not enough independent information to determine all of the stiffness reduction parameters.")(emphasis added); **Exhibit 8**, ("On N=2 Supersymmetric QCD with 4 Flavors" by Nicholas Dorey et al., hep-th9611016, DO-LE96 (November 1996)(stating on page 3 that "we will change the interpretation of the parameters τ and $\tilde{u}$ that appear in this expression; they will have different and *highly underdetermined* relation to physical observables of the microscopic theory than that proposed by Seiberg and Witten.")(emphasis added). Thus, Appellants respectfully submit that the term "severely determined" as well as similar terms "highly determined" and "significantly determined" are routinely used in numerous scientific disciplines and would be understood by one having ordinary skill in the Appellant's art.

Appellant's specification states, *inter alia*, that "[i]n summary, the damage detection method identifies stiffness parameters in structures, which have a small, medium, and large level of damage if the maximum reduction in the stiffnesses is within 30%, between 30 and 70%, and

over 70%, respectively" wherein "[a] large level of damage is studied in many examples because this poses the most challenging case, with sever [*sic*: severe] mismatch between the eigenparameters of the damaged and undamaged structures." (¶ [0179]). As noted in ¶ [0180], "[t]he damage detection method as embodied and broadly described herein can be applied to structures that can be modeled with beam elements" and ¶¶ [0181]-[0182] introduce damage detection using changes of natural frequencies "[f]or structures such as beams and lightning masts in electric substations, using only the changes in the natural frequencies can relatively accurately detect the location(s) and extent of damage, even though the system equations are *severely underdetermined* in each iteration." (emphasis added). Relating thereto and by way of example, ¶ [0188] of Appellant's specification cites, with reference to an example of an aluminum beam test specimen (see FIG. 12), the "*severely underdetermined system equations* (5 equations with 80 unknowns)." (emphasis added). In this example, the number of unknown significantly exceeds the number of equations. As noted above, the requirements for clarity and precision "must be balanced with the limitations of the language and the science" and "[i]f the claims, read in light of the specification, reasonably apprise those skilled in the art both of the utilization and scope of the invention, and if the language is as precise as the subject matter permits, the statute (35 U.S.C. 112, second paragraph) demands no more." *Shatterproof Glass Corp. v. Libbey Owens Ford Co.*, *supra*; *Hybritech, Inc. v. Monoclonal Antibodies, Inc.*, *supra*. The terminology "severely underdetermined," in context of the knowledge of those skilled in the art, the application disclosure, and the prior art, is submitted to reasonably apprise those skilled in the art both of the utilization and scope of the invention and is submitted to be reasonably precise in view of the subject matter, in compliance with 35 U.S.C. § 112, second paragraph.

Appellants respectfully submit that the level of ordinary skill in the art, given the totality

of the references of record, is a high one, and that the claims set out and circumscribe a particular subject matter with a reasonable degree of clarity to such person of ordinary skill. Accordingly, in view at least of the above, Appellants submit that the 35 U.S.C. § 112, second paragraph rejection is improper and the Examiner's rejection should be reversed.

2. 35 USC § 112, 1ST PARAGRAPH REJECTION

Claims 47, 49, and 60 were rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement.

The Examiner stated that these claims contain subject matter "which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention." In particular, the Examiner states that "[t]he 'number of stiffness parameters is larger than a number of system equations such that the system equations are severely underdetermined' is not described in the original disclosure."

In determining whether a written description issue exists, the fundamental factual inquiry is whether the specification conveys with reasonably clarity to those skilled in the art that, as of the filing date sought, applicant was in possession of the invention as now claimed. *Vas-Cath, Inc. v. Mahurkar*, 935 F.2d 1555, 1563-64 (Fed. Cir. 1991). An applicant shows possession of the claimed invention by describing the claimed invention with all of its limitations using such descriptive means as words, structures, figures, diagrams, and formulas that fully set forth the claimed invention. *Lockwood v. American Airlines, Inc.*, 107 F.3d 1565, 1572 (Fed. Cir. 1997). The subject matter of the claim need not be described literally (*i.e.*, using the same terms or *in haec verba*) in order for the disclosure to satisfy the description requirement (*see, e.g.*, MPEP § 2163.02).

By way of example, ¶ [0130] of Appellant's specification states that the system equations in Eqs. (5) and (6) involves $n_\lambda + n_\Phi N_m$ scalar equations with m unknowns, which are, in general determinate, if $n_\lambda + n_\Phi N_m = m$, under-determined if $n_\lambda + n_\Phi N_m < m$, and over-determined if $n_\lambda + n_\Phi N_m > m$. A system of linear equations is considered over-determined if there are more equations than unknowns, whereas an under-determined system of linear equations has more unknowns than equations (see, e.g., ¶ [0188] describing a scenario with a severely underdetermined system). Paragraphs [0182]-[0188] of the Appellant's specification notes the case wherein the number of unknown stiffness parameters are significantly larger than the number of equations (i.e., a severely underdetermined system)(see, e.g., page 8 of Amendment filed by Appellants on December 29, 2008). Appellant's specification discloses, *inter alia*, damage detection using changes of natural frequencies "[f]or structures such as beams and lightning masts in electric substations, using only the changes in the natural frequencies can relatively accurately detect the location(s) and extent of damage, even though the system equations are *severely underdetermined* in each iteration" (¶¶ [0181]-[0182])(emphasis added) and discusses an example of an aluminum beam test specimen (see FIG. 12) with "*severely underdetermined system equations* (5 equations with 80 unknowns)." (¶ [0188])(emphasis added).

It is respectfully submitted that the specification itself conveys with reasonably clarity to those skilled in the art that, as of the filing date sought, Appellants were in possession of the invention as now recited in claims 47, 49 and 60.

It is further submitted that the review as to written description is to be conducted from the standpoint of one of skill in the art at the time the application was filed (*see, e.g., Wang Labs. v. Toshiba Corp.*, 993 F.2d 858, 865 (Fed. Cir. 1993)) and should include a determination of the

field of the invention and the level of skill and knowledge in the art, there being an inverse correlation between the level of skill and knowledge in the art and the specificity of disclosure necessary to satisfy the written description requirement. *See, e.g., Hybritech, Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1379-80 (Fed. Cir. 1986).

Still further, "**the examiner has the initial burden**, after a thorough reading and evaluation of the content of the application, **of presenting evidence or reasons why a person skilled in the art <u>would not recognize</u> that the written description of the invention provides support for the claims**." See MPEP § 2163 (emphasis added). In particular, "[i]f applicant amends the claims and points out where and/or how the originally filed disclosure supports the amendment(s), and the examiner finds that the disclosure does not reasonably convey that the inventor had possession of the subject matter of the amendment at the time of the filing of the application, the examiner has the initial burden of presenting evidence or reasoning to explain why persons skilled in the art would not recognize in the disclosure a description of the invention defined by the claims." (*see, e.g.*, MPEP § 2163 and MPEP § 2163.04).

Appellants respectfully submit that the Examiner has failed to discharge his burden and has further failed to set forth any factual findings supporting the conclusory allegation of lack of written description. *See, e.g., Purdue Pharma L.P. v. Faulding Inc.*, 230 F.3d 1320, 1323 (Fed. Cir. 2000)(the written description "inquiry is a factual one and must be assessed on a case-by-case basis"). For at least the above reasons, it is respectfully submitted that this Honorable Board would be proper in reversing the Examiner's 35 U.S.C. 112, first paragraph, written description rejection.

3. THE 35 U.S.C. § 103(A) REJECTION OF CLAIMS 56-58

Claims 56-58 were rejected under 35 U.S.C. § 103(a) over Stubbs (US 5,327,358).

Stubbs was alleged to disclose a system comprising "a structure (structure, Abstract, line 1; specimen 42)" and "a random impact device (impact hammer, column 5, line 51) for introducing vibrations in said structure (column 5, lines 50-53)".

Stubbs was further alleged to disclose "an impact applicator (impact hammer has steel tip, Google search, page 1, paragraph 2) such that the force (40) and arrival times of said impact applicator at said structure (42) are random (column 5, lines 50-53) such that the force (40) and arrival times of said impact applicator at said structure (42) are random (column 5, lines 50-53)". Stubbs was also alleged to disclose "a sensor (claim 1, line 4) arranged to measure vibrations of said structure (claim 1, lines 4-5) and output vibration information (measured first signal, claim 1, lines 4-5)" and "a stiffness parameter unit for receiving said vibration information (column 1, lines 56-58; column 25, lines 31-34; 104, Fig. 5), determining natural frequency data of said structure (column 5, lines 8-9; column 7, lines 17-21; Table 14), and determining the stiffness parameters of said structure using said natural frequency data (using equation 1, column 5, which expresses the relationship between natural frequencies and stiffness parameter)."

Stubbs was acknowledged not to disclose the following claimed features:

- Regarding claim 56, said random impact device comprising a random signal generating unit for generating first and second outputs; a random impact actuator for receiving said first and second outputs; and an impact applicator coupled to said random impact actuator, wherein said random impact actuator drives said impact applicator.
- Regarding claim 57, said random impact actuator drives said impact applicator in accordance with said first and second outputs.
- Regarding claim 58, the first and second outputs comprise independent random variables.

The Examiner continued on, however, to assert that "[n]evertheless, Stubbs discloses

that the random impact device is a PCB board (PCB 086B01, column 5, line 51)" and alleges "**[i]t would be obvious to electrically actuate the PCB impact device with electric signals since the device is an electrical device**." (emphasis added).

It is not believed necessary to address all of the inaccuracies and inadequacies of the instant rejection as the Examiner has already acknowledged that Stubbs fails to disclose "said random impact device comprising a random signal generating unit for generating first and second outputs; a random impact actuator for receiving said first and second outputs; and an impact applicator coupled to said random impact actuator, wherein said random impact actuator drives said impact applicator."

Starting first with the Appellant's claims and disclosure, claims 56-59 recite a **random impact device** for introducing vibrations in said structure, said random impact device comprising (1) a **random signal generating unit** for generating first and second outputs, (2) a **random impact actuator** for receiving said first and second outputs, and (3) an **impact applicator coupled to said random impact actuator**, wherein (4) **said random impact actuator drives said impact applicator such that force and arrival times of said impact applicator at said structure are random**.

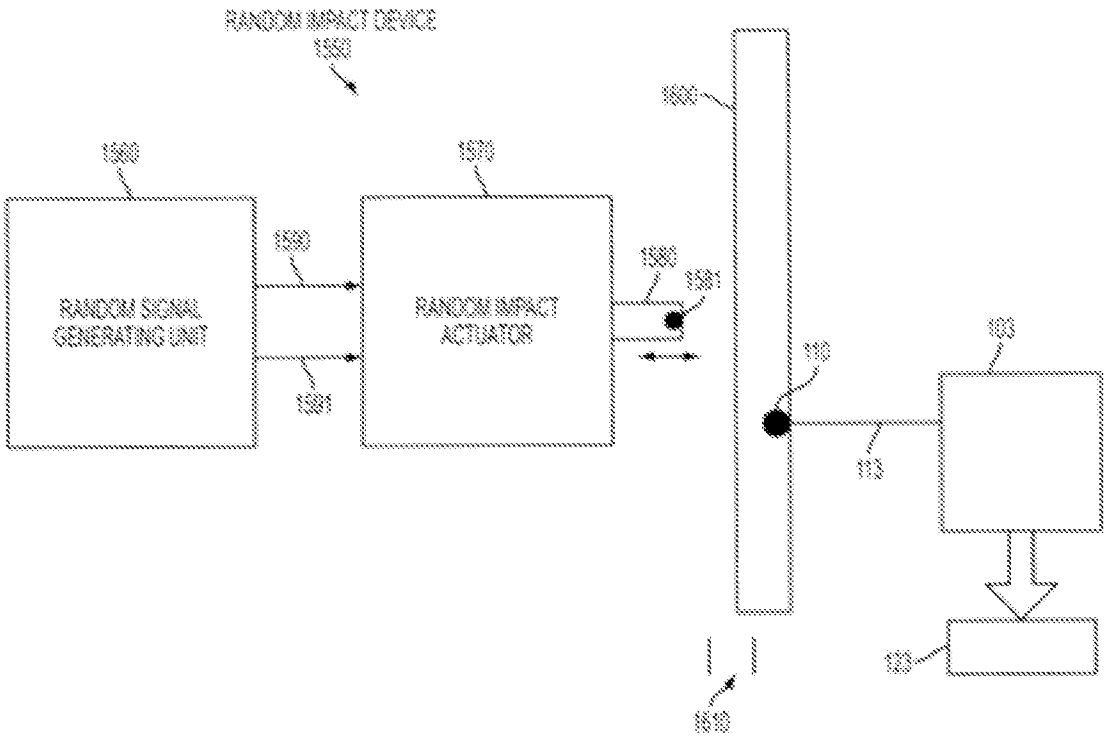

FIG. 31

As described in ¶ [0228] of Appellant's specification, FIG. 31 shows a random impact device 1550, according to one embodiment of the invention. Random impact device 1550 includes random signal generating unit 1560 and a random impact actuator 1570 with impact applicator 1580. *Id.* The impact applicator 1580 optionally includes a sensor 1581, such as a force transducer, attached at its tip, such sensor preferably being configured to send data to the spectrum analyzer in stiffness parameter unit 103 in order to obtain mode shape information. *Id.* Random impact signal generating unit 1560 is coupled to and provides outputs 1590 and 1591 to random impact actuator 1570. *Id.*

As described in ¶ [0230] of Appellant's specification, an exemplary impact applicator 1580 is represented in FIG. 31 as an impacting structure 1600 configured for a reciprocating

motion, as indicated by the dual headed arrow. Paragraph [0230] further states that impact applicator 1580 has an impact path 1610, such that when a structure 1600 lies within the impact region 1610, impact applicator 1580 impacts structure 1600 with a force of random amplitude that arrives at a random time. The impact applicator 1580 and impact region 1610 as shown in FIG. 31 is one possible embodiment, and other shapes and impact regions may be used while still falling within the scope of the present invention. *Id.*. Of course, as noted in ¶ [0231] of Appellant's specification, signal generating unit 1590 could output any signal or signals that ultimately results in random impact actuator 1570 driving impact applicator 1580 to impact structure 1600 with random arrival times τ_i and random amplitudes φ_i.

Appellant's specification further notes in ¶ [0227] that different methods have been employed in conventional vibration testing in order to excite a test specimen such as shaker testing, which can produce a high signal to noise ratio and can induce random excitation, but which can average out slight nonlinearities and extract linearized eigenparameter parameters. However, shaker testing is not practically employed in the field on relatively large structures, and can be cost prohibitive to conduct. *Id.* Appellant's specification further describes single impact hammer testing, which addresses the shortfalls of shaker testing in that it is portable and inexpensive to conduct, but provides a low energy input and a low signal to noise ratio with no randomization. *Id.* (*see also, e.g.,* ¶¶ [0225]-[0226] (*stating* that Appellants series of random impacts has been shown to increase an energy input to the structure 10 and improve the signal to noise ratio, especially in such situations as strong wind excitation, and average out slight nonlinearities that arise, for example, from bolted joints and extract linearized eigenparameters); ¶¶ [0227]-[0323]).

Given this disclosure, attention must again be directed to the failure of Stubbs to

disclosure anything resembling, let alone disclosing or suggesting, that which is recited in claims 56-58. The Examiner asserted that "Stubbs discloses that the random impact device is a PCB board (PCB 086B01, column 5, line 51)" and alleged that "[i]t would be obvious to electrically actuate the PCB impact device with electric signals since the device is an electrical device". Column 5, line 51, of Stubbs, cited by the Examiner, states that "[s]pecimen 42 receives physical excitation force 40 from an impact hammer (PCB 086B01) (not shown) having a maximum frequency range of 10 KHz." FIG. 4a merely shows, regarding such impact hammer, that an "excitation" is applied to specimen 42.

Stubbs has not been shown to disclose or suggest a random impact device comprising (1) a random signal generating unit for generating first and second outputs, (2) a random impact actuator for receiving said first and second outputs, and (3) an impact applicator coupled to said random impact actuator, wherein (4) said random impact actuator drives said impact applicator such that force and arrival times of said impact applicator at said structure are random. The entirety of the Examiner's assertion of "obviousness" is that an impact hammer is disclosed in Stubbs and that it can receive an electrical signal.

As further acknowledged by the Examiner, Stubbs also fails to disclose that the random impact actuator drives the impact applicator in accordance with the first and second outputs from the random signal generating unit (claim 57).

As further acknowledged by the Examiner, Stubbs also fails to disclose that, further to claim 57, "the first and second outputs comprise independent random variables."

To all of these limitations, the Examiner cites to Stubbs "impact hammer" (col. 5, line 51) and apparent ability to receive an electrical signal.

To establish *prima facie* obviousness of a claimed invention, all the claim limitations

must be taught or suggested by the prior art. *See U.S. Surgical Corp. v. Ethicon, Inc.,* 103 F.3d 1554, 1564 (Fed. Cir. 1997)(affirming a district court's instructions to a jury that "the prior art must show not only all of the elements of the claimed combination, but must contain some 'teaching, suggestion or incentive' to a person of ordinary skill to combine the known elements in the way that" the inventor combined them"); *Abbott Labs. v. Sandoz, Inc.*, 500 F. Supp. 2d 846, 851 (N.D. Ill. 2007) ("the need to demonstrate the presence of all claim limitations in the prior art (when the legal theory is based upon obviousness due to the combination of prior art teachings) has not been obviated" by *KSR*) *aff'd* 544 F.3d 1341 (Fed. Cir. 2008); *see also In re Royka*, 490 F.2d 981 (CCPA 1974). The Examiner bears the initial burden to factually support and establish *prima facie* obviousness under 35 U.S.C. § 103. *See, e.g., In re Rijckaert*, 9 F.3d 1531, 1532 (Fed. Cir. 1993); *Ex parte Koo*, Appeal No. 2008-1344 (BPAI Nov. 26, 2008), slip. op. at 8; *see also Ex Parte Wada* (*stating* "a searching comparison of the claimed invention – *including all its limitations* – with the teaching of the prior art."), Appeal 2007-3733 (BPAI, Jan. 14, 2008)(emphasis in original), slip. op. at 7. Stubbs certainly has not been shown to, and indeed does not, disclose each and every element of claims 56-58, as is recognized by the Examiner. The Examiner has not discharged his burden by the generalized assertion that Stubbs discloses a mere impact hammer. Broad conclusory statements, standing alone, are not "evidence". *McElmurry v. Arkansas Power & Light Co.*, 995 F.2d 1576, 1578 (Fed. Cir. 1993). Thus, the Examiner's assertion of motivation fails for want of evidence for at least this reason.

"[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be 'some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.'" *KSR*, 127 S. Ct. at 1741 (*citing In re Kahn*,

441 F.3d 977, 988 (Fed. Cir. 2006)). This requirement is as much rooted in the Administrative Procedure Act ("APA"), which ensures due process and non-arbitrary decisionmaking, as it is in § 103.")(citations omitted)(*cited with approval*, *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1741 (2007). The Federal Circuit has stated that "rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006), *cited with approval in KSR*, 550 U.S. at 418.

The Board of Patent Appeals and Interferences has routinely reversed Examiner's for premising assertions of *prima facie* obviousness under 35 U.S.C. § 103 upon speculation or conjecture. *See, e.g., Ex parte Butterfield* (Appeal No. 2009-002995, Application 11/671,818)(Bd. Pat. App. & Inter. July 30, 2009); *Ex parte Anders* (Appeal No. 2009-000424, Application 10/759,931)(Bd. Pat. App. & Inter. July 28, 2009); *Ex parte Grunau* (Appeal No. 2009-000614, Application 10/995,959)(Bd. Pat. App. & Inter. July 9, 2009); *Ex parte Preisach* (Appeal No. 2009-003219, Application 10/752,022)(Bd. Pat. App. & Inter. June 30, 2009)(stating that "[a] rejection based on § 103 must rest upon a factual basis rather than conjecture or speculation" and that "'[w]here the legal conclusion [of obviousness] is not supported by facts it cannot stand.'" *citing In re Warner*, 379 F.2d 1011, 1017 (CCPA 1967) and *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)); *Ex parte Cohen-Solal* (Appeal No. 2008-005770, Application 09/896,199)(Bd. Pat. App. & Inter. June 30, 2009).

The express, implicit, and inherent disclosures of a prior art reference may be relied upon in the rejection of claims under 35 U.S.C. §§ 102 or 103. "The inherent teaching of a prior art reference, a question of fact, arises both in the context of anticipation and obviousness." *In re Napier*, 55 F.3d 610, 613 (Fed. Cir. 1995). However, a bald assertion that

a certain result or characteristic *may occur* or *may be present* in the prior art is not sufficient to establish the inherency of that result or characteristic. *In re Rijckaert*, 9 F.3d 1531, 1534 (Fed. Cir. 1993) (rejection reversed because alleged inherency was based on what would result due to optimization of conditions, not what was necessarily present in the prior art); *see also, In re Oelrich*, 666 F.2d 578, 581-82 (CCPA 1981). "To establish inherency, the extrinsic evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, ***may not*** be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient." *In re Robertson*, 169 F.3d 743, 745 (Fed. Cir. 1999)(citations and internal quotations omitted)(emphasis added). To the extent an Examiner desires to rely upon the theory of inherency, the examiner <u>must</u> provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic <u>*necessarily*</u> flows from the teachings of the applied prior art. *Ex parte Levy*, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990). Even were the Examiner in the instant case to explicitly allege inherency, the Examiner has failed to provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic <u>*necessarily*</u> flows from the teachings of Stubbs. It is respectfully submitted that the Examiner's implicit assertion that certain disputed element *may be possible* is factually and legally insufficient to discharge the Examiner's duty to set forth **facts** supporting the assertion of *prima facie* obviousness.

In the Final Office Action, the Examiner takes the position that "Stubbs discloses a random impact device (impact hammer, column 5, lines 50-52)" and that "***[s]ince the impact device an electric device*** (PCB 086B01, column 5, line 51), ***it would be obvious to provide the***

impact device with **(1)** a random signal generating unit for generating first and second outputs since it is obvious to provide a power supply for generating a power output and a return power output to the impact device to supply power to **(2)** a random impact actuator (body of the impact device; power signals are supplied to the body of impact device). Stubbs discloses that specimen (42) receives a physical force (40) from the impact device (column 5, lines 50-51)" and "**(3)** an impact applicator (portion of impact device that exerts force (40)) coupled to said random impact actuator for providing optimum support (the body can provide optimum support for elements coupled to it)." (page 11)(emphasis added).

The Examiner further alleges that "Stubbs discloses that the random device operates <u>within a range of frequencies</u> (column 5, lines 50-53; column 6, lines 31-35) and <u>by variations of the input force and duration of excitation</u> applied to the structure (column 6, 57-60)." (page 11 of Final Office Action)(emphasis in original). Thus, concludes the Examiner, "it would be obvious that (4) said random impact actuator drives said impact applicator such that force and arrival times of said impact applicator at said structure are random." *Id.* at page 12.

It is axiomatic that the Examiner construes Stubbs favorably to the asserted obviousness. However, the Examiner's proffered reading of Stubbs is misleading, as Stubbs actually teaches away from the results achieved, disclosed and claimed by Appellants.

Stubbs discloses that "[f]or any structure, the natural modes of vibration ***<u>depend only upon the mechanical characteristics of the structure and not upon the excitation</u>***." (col. 1, lines 64-66)(emphasis added). In contrast to the insensitivity of input force and duration taught by Stubbs, Appellants disclose that "[a]lthough accurate and reliable damage assessments can be achieved regardless of how the impact F is applied to the structure 10, ***results may be improved using a random series impact method, which involves using a series***

of impacts F of random amplitudes and random arrival times" and that "[a] series of random impacts has been shown to increase an energy input to the structure 10, improve the signal to noise ratio, especially in such situations as strong wind excitation, and average out slight nonlinearities that arise, for example, from bolted joints and extract linearized eigenparameters." (see ¶ [0225]).

Stubbs, in fact, actually **teaches away from** Appellants disclosure and claims, stating that "***the response functions*** illustrated in plots 67a-b ***are unaffected by variations in the input force and duration of excitation applied to the structure***." (col. 6, lines 57-60, cited by the Examiner)(emphasis added). A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant. A reference will teach away if it suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the applicant. *See United States v. Adams*, 383 U.S. 39, 52, 148 USPQ 479, 484 (1966)("known disadvantages in old devices which would naturally discourage the search for new inventions may be taken into account in determining obviousness"); *W.L. Gore & Assoc, Inc. v. Garlock, Inc.,* 721 F.2d 1540, 1550-51, 220 USPQ 303, 311 (Fed.Cir.1983) (the totality of a reference's teachings must be considered), *cert. denied*, 469 U.S. 851, 105 S.Ct. 172, 83 L.Ed.2d 107 (1984); *In re Caldwell*, 319 F.2d 254, 256, 138 USPQ 243, 245 (CCPA1963) (reference teaches away if it leaves the impression that the product would not have the property sought by the applicant). Stubbs, referring to the plots 67a, 67b of FIG. 4b representing the vibration frequency response of specimen 42 in the frequency domain rather than the time domain teaches that "variation in the input force and duration have no effect on the response

functions." Likewise, as noted above, Stubbs discloses that "the natural modes of vibration depend only upon the mechanical characteristics of the structure and not upon the excitation." From this, the Examiner would have this Board conclude that something that is not taught or disclosed therein, and something that is not suggested by the disclosure thereof, would nonetheless somehow suggest that which is disclosed and claimed by Appellants. The Examiner's suppositions are without merit.

"[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006), *cited with approval in KSR*, 550 U.S. at 418. Moreover, asserted *prima facie* cases of obviousness under 35 U.S.C. § 103 cannot be properly premised upon speculation or conjecture. *See, e.g., Ex parte Butterfield* (Appeal No. 2009-002995, Application 11/671,818) (Bd. Pat. App. & Inter. July 30, 2009); *Ex parte Anders* (Appeal No. 2009-000424, Application 10/759,931)(Bd. Pat. App. & Inter. July 28, 2009); *Ex parte Grunau* (Appeal No. 2009-000614, Application 10/995,959)(Bd. Pat. App. & Inter. July 9, 2009); *Ex parte Preisach* (Appeal No. 2009-003219, Application 10/752,022)(Bd. Pat. App. & Inter. June 30, 2009)(stating that "[a] rejection based on § 103 must rest upon a factual basis rather than conjecture or speculation" and that "'[w]here the legal conclusion [of obviousness] is not supported by facts it cannot stand.'" *citing In re Warner*, 379 F.2d 1011, 1017 (CCPA 1967) and *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)); *Ex parte Cohen-Solal* (Appeal No. 2008-005770, Application 09/896,199)(Bd. Pat. App. & Inter. June 30, 2009). This requirement is as much rooted in the Administrative Procedure Act ("APA"), which ensures due process and non-arbitrary decision-making, as it is in § 103.")(citations omitted)(*cited with approval*, *KSR*

Int'l Co. v. Teleflex Inc., 127 S. Ct. 1727, 1741 (2007).

Early on, the Supreme Court has recognized the dangers of hindsight bias, astutely observing that "[k]nowledge after the event is always easy, and problems once solved present no difficulties." *Diamond Rubber Co. v. Consolidated Rubber Tire Co.*, 220 U.S. 428, 435 (1911). The esteemed Judge Learned Hand likewise identified the problem of hindsight bias making inventions appear obvious after-the-fact because all inventions, at their core, are combinations of prior art, but he emphasized that such an after-the-fact perspective does not prevent an invention from being original. *B. G. Corp. v. Walter Kiddie & Co.*, 79 F.2d 20, 22 (2d Cir. 1935)(Hand, J.). *Graham* v. *John Deere Co. of Kansas City* warned against a "temptation to read into the prior art the teachings of the invention in issue" and instructed courts to "'guard against slipping into the use of hindsight'" 383 U.S. 1, 36 (1966)(*quoting Monroe Auto Equipment Co.* v. *Heckethorn Mfg. & Supply Co.*, 332 F.2d 406, 412, 141 USPQ 549 (CA6 1964))). More recently, the Supreme Court in *KSR Int'l Co. v. Teleflex Inc.* cautioned that the factfinder "should be aware, of course, of the distortion caused by hindsight bias and must be cautious of arguments reliant upon *ex post* reasoning." 127 S.Ct. 1727, 1741, 82 USPQ2d 1385, 1397 (2007).

Regarding the Examiner's assertions regarding claims 57, claim 57 is submitted to be patentable over Stubbs based at least upon the dependency of claim 57 on independent claim 56 for the reasons set forth above.

As to the Examiner's assertions regarding claim 58, which depends from claim 57, wherein the Examiner alleged "in light of the discussions above with respect to force and frequency, it would be obvious that the first and second outputs comprise independent random variables since it is obvious to change the frequency and amplitude of the power signals to the

impact device for the purpose of varying the force and frequency of the impact device," there is again submitted to be no rational teaching or suggestion provided in Stubbs to provide a random signal generating unit configured to generate first and second outputs that comprise independent random variables to drive a random impact applicator, as claimed. Despite no teaching or suggestion in Stubbs, as described above, the Examiner asserts that it would be "obvious to change the frequency and amplitude of the power signals to the impact device for the purpose of varying the force and frequency of the impact device." Claim 58 recites more than "varying the force and frequency of the impact device," as is being alleged by the Examiner. Instead, claim 58 recites that the "first and second outputs comprise independent random variables" and that these signals are used to drive the random impact actuator "such that force and arrival times of said impact applicator at said structure are random." There is nothing obvious about these limitations, nor has Stubbs been shown to contain any disclosure that would teach or suggest these limitations, for at least the reasons noted above.

VIII. SUMMARY

Appellants respectfully urge this Honorable Board to reverse the Examiner on each of the aforementioned grounds of rejection presented for review on appeal.

The fees for the notice of appeal and the appeal brief were previously paid. The Commissioner is hereby authorized to charge Nixon Peabody, P.C. Deposit Account No. 50-4181, Order No. 266923-000007USPT, for any fees that may be inadvertently omitted which may be necessary now or during the pendency of this application, except for payment of the issue fee. Likewise, please credit any overcharges to the same Deposit Account.

Respectfully submitted,

Date: June 20, 2011

By: /William D. PEGG, Reg. # 42,988/

William D. Pegg
Reg. No. 42,988
Attorney for Appellant
Nixon Peabody LLP
300 South Riverside Plaza
16th Floor
Chicago, Illinois 60606
(312) 425-3900

IX. APPENDIX - CLAIMS ON APPEAL

1-46. (Cancelled).

47. A system for determining stiffness parameters of a structure, comprising:

a sensor arranged to measure vibrations of said structure and output vibration information; and

a stiffness parameter unit for receiving said vibration information, determining natural frequency data of said structure, and determining the stiffness parameters of said structure using said natural frequency data;

wherein said stiffness parameter unit comprises an iterative processing unit that determines said stiffness parameters using a first order eigenvalue sensitivity analysis and one of the generalized inverse method, gradient method, or quasi-Newton method,

wherein a number of said stiffness parameters is larger than a number of system equations such that the system equations are severely underdetermined.

48. (Cancelled).

49. A system for determining stiffness parameters of a structure, comprising:

a sensor arranged to measure vibrations of said structure and output vibration information; and

a stiffness parameter unit for receiving said vibration information and determining said stiffness parameters with an iterative processing unit;

wherein said stiffness parameter unit comprises an iterative processing unit that determines said stiffness parameters using a first order eigenvalue sensitivity analysis ,

wherein a number of said stiffness parameters is larger than a number of system equations such that the system equations are severely underdetermined.

50-55. (Cancelled).

56. A system for determining stiffness parameters of a structure, comprising:

a structure;

a random impact device for introducing vibrations in said structure, said random impact device comprising:

a random signal generating unit for generating first and second outputs;

a random impact actuator for receiving said first and second outputs; and

an impact applicator coupled to said random impact actuator, wherein said random impact actuator drives said impact applicator such that force and arrival times of said impact applicator at said structure are random;

a sensor arranged to measure vibrations of said structure and output vibration information; and

a stiffness parameter unit for receiving said vibration information, determining natural frequency data of said structure, and determining the stiffness parameters of said structure using said natural frequency data.

57. The system of claim 56, wherein said random impact actuator drives said impact

applicator in accordance with said first and second outputs.

58. The system of claim 57, wherein the first and second outputs comprise independent random variables.

59. (Allowed).

60. A system for determining stiffness parameters of a structure, comprising:

a sensor arranged to measure vibrations of said structure and output vibration information; and

a stiffness parameter unit for receiving said vibration information, determining mode shape information, and determining the stiffness parameters of said structure using said mode shape information;

wherein said stiffness parameter unit comprises an iterative processing unit that determines said stiffness parameters using a first order eigenvector sensitivity analysis,

wherein a number of said stiffness parameters is larger than a number of system equations such that the system equations are severely underdetermined.

61. (Cancelled).

62-65. (Allowed).

X. APPENDIX – EVIDENCE

1. March 8, 2011 Final Office Action (**Exhibit 1**)

2. Copy of Appellant's U.S. Patent Application Publ. No. 2005/0072234 A1 (**Exhibit 2**).

3. U.S. Pat. No. 6,526,354 (**Exhibit 3**).

4. U.S. Pat. No. 5,654,820 (**Exhibit 4**).

5. "TVAR Modeling of Event Related Synchronization Changes. The Optimal Basis Approach" by J.P. Kaipioy and P.A. Karjalainenz, University of Kuopio Department of Applied Physics Report Series ISSN 0788-4672 (March 1995) (**Exhibit 5**).

6. "Solving or Resolving Inadequate and Noisy Tomographic Systems" by Guust Nolet, Journal of Computational Physics 61, 463-482 (1985) (**Exhibit 6**).

7. "Damage Identification and Health Monitoring of Structural and Mechanical Systems from Changes in Their Vibration Characteristics: A Literature Review" by Doebling, Scott W., et. al., Los Alamos National Laboratory, (May 1996) (**Exhibit 7**).

8. "On N=2 Supersymmetric QCD with 4 Flavors" by Nicholas Dorey et al., hep-th9611016, DO-LE96 (November 1996) (**Exhibit 8**).

9. Replacement drawings submitted on September 9, 2010 (**Exhibit 9**).

XI. APPENDIX – RELATED PROCEEDINGS

None.

XII. APPENDIX – RELATED APPLICATIONS

None.